

# Montaña Suiza de Aranjuez – Slope Monitoring

CLIENT: ACRE / PATRIMONIO NACIONAL

How wireless monitoring was used to inform decision making and safeguard a vulnerable slope at UNESCO World Heritage Site in Madrid

## Challenge

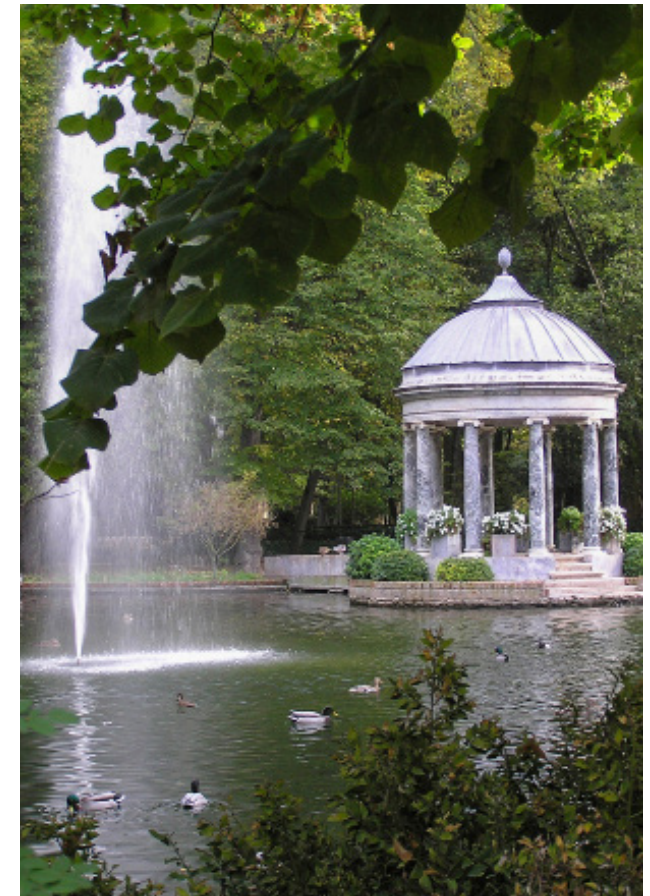
Throughout the 18th century the kings of Spain renovated the royal site of Aranjuez, enhancing it with the Garden of the Prince - a large picturesque park to the northeast of the palace, which is frequently visited by tourists when visiting the Royal Palace.

This 150 hectare garden – one of the largest in Spain - was created in an Anglo-French style that stands out for its botanical richness, marble fountains and neoclassical pavilions. One of the pavilions is located on a hill, a space often enjoyed for its beautiful views, most notably by King Charles IV.

In the winter of 2020, a crack was discovered in the access road to the pavilion, as well as damage to the wooden railings around the site. This raised concerns that further ground movement could put public safety at risk. This area was immediately closed to the public so the slope displacement could be investigated.

## Key Points:

- Cracks and damage to a road and railings were discovered near a famous pavilion in the Garden of the Prince, Madrid
- ACRE installed NanoPlus tilt metres on stakes in the area of concern to monitor small trends in slope displacement to determine if further movement was taking place
- Monitoring will continue until it is determined that the site is safe and can be re-opened to the public without risk of landslide
- Any movements exceeding thresholds will automatically send notifications to stakeholders
- Remote monitoring has enabled informed decision making, with a reduction in site visits bringing cost and safety benefits





## Solution

The authorities responsible for the garden contacted surveying solutions expert ACRE to propose a deformation monitoring solution. They needed a robust and accurate solution that could monitor small trends in slope displacement to determine if further movement was taking place. ACRE recommended a wireless monitoring approach using Senceive FlatMesh™ Nano tilt meters because of their ease of installation, precision and high resolution measurement.

Once the area of the slope that needed to be monitored was defined, ACRE installed Nanos on six 1.5 metre stakes. The stakes were set out in two rows, one next to the fence where the damage had occurred, and the other at the bottom of the slope.

A FlatMesh™ Gateway, with fixed power supply, was placed in a nearby house. The Gateway was set up to relay data from the sensors to a secure WebMonitor™ data viewing platform at 30 minute intervals. A series of movement thresholds were defined. Any movements exceeding these thresholds would trigger automatic SMS and email notifications to WebMonitor™ users.

## Outcome

At the time of writing, no trigger levels have been breached and the slope deformation appears to have been an isolated incident, but monitoring will continue until it is determined that the site is safe and can be re-opened to the public without risk of landslide.

The FlatMesh™ system has provided the client, Patrimonio Nacional (National Heritage) with precise and timely data to provide reassurance that any further movement will be quickly detected. Remote monitoring will continue to enable informed decision making, with a reduction in site visits bringing cost and safety benefits.

The risk mitigation and added safety offered by Senceive technology is helping to protect people and assets. ACRE supplies Senceive products in Spain, Portugal, Panama, Peru, and Mexico, offering full customer support and technical assistance.

